Ep-Ip Characteristic Curves of Magnetron

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The experimental results worthy of notice is that the inhomogeneity due to the inefficiency of the grid shielding for the electronegative gases is much smaller than in the case of electron collection owing to the fact that in the former case both positive and negative ions are utilized if the amplifier time constant is properly chosen. This fact makes it possible to use a grid of low shielding effect which consequently allows the use of relatively low voltage, the essential requirement in the electronegative gases, to prevent the capture of ions.

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46. E_p-I_p Characteristic Curves of Magnetron.

Kiichi Kimura, Isao Kumabe, Tetsuro Nakatau, Hidero Ueyanagi and *Asao Kusumegi.*

(K. Kimura Laboratory)

Magnetron M-312 (wave length 10 cm), operated by D.C. anode voltage and A.C. (60 cycle) cathode voltage, was used, and E_p-I_p characteristic curves on the screen of the Braun-tube were observed in the following various cases.

1. Difference between the static and the dynamic characteristic curves.
2. Complicated phenomenon in the neighbouring region of the dynatron characteristic curve.
3. Change of the characteristic curve of the inclination of the tube axis against that of the external magnetic field.
4. Change of the characteristic curve against that of load impedance.
5. Change of the characteristic curve against that of the filament current.
6. Oscillation region on E_p-I_p characteristic curve.

Sufficient analyses have not yet been obtained about the above phenomena on account of their complexity except the following phenomena.

7. Figures of characteristic curve were changed by the reversal of the direction of the operating magnetic field, phase of the heater voltage or phase of A.C. voltage operated in the cathode, but figures after the reversal were same.

It was found that this was due to the effect of the magnetic field which was produced by the hecter solenoid. Calculated values of this magnetic field are -500 gauss at the center of the heater solenoid, 10 gauss at the center between the anode and the cathode, and 2 gauss at the anode. In this case the heater was 0.28 cm in diameter, 1.4 cm long, with twenty turns, and the maximum peak current was $20\sqrt{2}$ ampere.

Although this magnetron is operated by D.C. anode voltage only, the out-put will be modulated with 60 cycle according to the A.C. magnetic field of the heater solenoid which is heated by A.C. current of 60 cycle. Also in the case of the pulse

modulation, the pulse will be modulated with 60 cycle.

This phenomenon (7.) will occur only in the magnetron of the high power and the direct heating cathode type.

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47. Trial Manufacture of Electron Accelerator.

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We achieved a trial manufacture of an electron accelerator using a single cavity resonator. In the first place, we performed the preliminary experiments about the resonant wave length of the reentrant-type cavity, but decided suitable dimentions of the cavity experimentally because we found that the various theories about it provide disagreement with our experiments.

Our cavity is 4.4 cm long, 3.4 cm in diameter, 0.58 cm in nose diameter, 1 cm in the accelerator gap length, about 0.66 MΩ shunt resistance, and it has gold-plated inside for the requirement of the good conductivity.

Oscillator is a magntron M-312 (wave length: 10 cm) operated by D.C. 4 kV anode voltage, A.C. (60 cycle) 3.5 kV cathode voltage and external magnetic field of 820 gauss. The above-mentioned cavity resonator was excited by the loop coupling through the cylindrical wave guide and the coaxial cable, and electron acceleration was tested by the electric field (about 20 kV) in the axial direction of the cavity. And 18 kV electrons were obtained. Then input power into the cavity was about 300 W and the pressure was 3×10^{-5} mm Hg. Electron energy was measured on the fluorescent screen by the magnetic deflection. Electrons which were emitted from a Th-W filament and were focused by Wehnelt cylinder, were accelerated at 4 kV and were injected on the cavity. The nose length in the cavity is controled by bellows from the vacuum outside for the purpose of obtaining the resonance of the cavity.

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48. On Some Properties of 2π-type Counter. (II)

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We found that natural counts of 2π-type counter were approximately proportional to the length of the center wire of a counter, not to the length of a cathode cylinder.